Adriatic Sea. By far the greater number of Mediterranean depressions belong to this group; those approaching from the west as independent formations and those of the origin here discussed that change into long continuing depressions and move into Hungary are relatively few.

The wedge of high pressure, and not the pocket of low pressure encroaching on the Mediterranean Sea, is the disturbance feature of the first day. This, also, results from the isolating influence of the Alps. North of these mountains the depression is advancing with characteristic falling pressure and rising temperature at its front. At the south temperature conditions do not change; the mountains obstruct flow of air to the northwestern depression and there is no thermal pressure wave—the primary wave is isolated. With horizontal supply of air from the south thus cut off the regions north of the Alps fill with air from aloft. This has potentially higher temperature and in its descent produces foehn effects and adds intensity to the primary pressure wave.—*W. W. Reed.*[2]

NOTE.

Reference to weather maps for November 3, 7, 8, 10, 15, 16, 17, 26, 1917 shows that a deformation of isobars similar to that given in figure 4 of the paper (*Met. Zeit.* Dec. 1920, p. 3 5), is found south of the Appalachian Mountains (vicinity of Atlanta, Ga.), when an area of high pressure is approaching.

This may be due to an isolation of "primary wave of pressure," although it occurs with increasing pressure whereas the isolation occurs with diminishing pressure in the region of the Alps.

Mention is made of this since it may be thought interesting to note this in connection with the abstract above.—*W. W. R.*

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FORECASTING THE CROPS FROM THE WEATHER.

By R. A. HOOKER.

[Excerpts from the *Quarterly Journal of the Royal Meteorological Society*, April, 1921. 47: 75-93.]

There are two main lines of research which have attracted the attention of trained scientific men in the investigation of the conditions which induce good or bad crops. These two lines are firstly, the determination of a cycle of a definite number of years at the end of which similar meteorological and, as a consequence, agricultural, phenomena are reproduced; and secondly, the effects of different types of weather during or shortly before the growing season of the crops.

Concerning the first method I shall say but little, not because I wish to be regarded as skeptical of its practicability but because I am insufficiently versed in the matter. The second line of research consists in comparing deviations of the crops from the average with precedent deviations of various meteorological phenomena from the normal.

Early students were handicapped by lack of data concerning the crops and many of the crops were merely listed as "good" or "bad" thus making accurate summarization impossible.

The beginning of this branch of study started with the inquiry of Gilbert and Lawes, in 1880, of the relationships between the winter rainfall and the yield of wheat the subsequent autumn. They concluded, on the strength of 14 years data, that seasons of highest productiveness were characterized by higher than average temperatures during most of the winter and early spring, and a prevailing deficiency of rain in winter and spring.

An advance in scientific procedure is to be marked when actual statistics of crops begin to be available in sufficient quantity. Sir Rawson W. Rawson, in examining the relation between the rainfall and the sugar crops on the island of Barbados, found that for every inch of rainfall during the preceeding year, a yield of 800 hogsheads of sugar in the whole island [the area having been fairly constant for some years]. Thus he proposed to predict the crops by multiplying the preceding years rainfall by 800.

England is far behind in "agricultural meteorology" although other countries have not advanced very far. The first author I mention outside England is S. M. Jacobs of the Indian Meteorological Society. In 1910, he published a paper in which he correlates the area of unirrigated "matured" autumn and spring crops with the rainfall of the preceding six months, obtaining various coefficients ranging up to + 0.73 between the spring crop and rain in the preceding winter. This work does not take any one crop but all the crops combined.

Mr. Jacobs in his second paper marks an advance upon his earlier one, mainly in two directions; he now deals with individual crops and he utilizes Kincer's method of dealing with crops suspected of being grown under optimum conditions.

Among the results obtained in the second paper are the following: (1) The area sown with "well-irrigated" wheat in Jullundur is closely correlated, negatively, with the rainfall of August, September, and October, partial coefficients of −0.79, −0.86, and −0.74 respectively being found. (2) With unirrigated spring crops [taken together], the correlation coefficient is high and positive, September +0.74 thus a dry season leads to a reduction in the area of spring crops. (3) Turning to yield Jacobs correlates the deficiency below normal of "well-irrigated" wheat with the rainfall of various months. (4) With unirrigated wheat he gets regression equations which furnish a fair estimate only. He accordingly suspects that the conditions on such land are nearly optimum, and, following Kincer, weights the rainfall for each month with certain factors found empirically. Correlating this weighted rainfall with the area of unirrigated wheat, he obtains a coefficient of +0.91. This almost amounts to proof that, as far as regards precipitation, the climate of Jullundur is practically of optimum for wheat.

This work of correlating weather and crops is of paramount importance; to anticipate, with a reasonable degree of probability, a type of weather known to be injurious to crops will save many dollars.

The determination of the relationships between a crop and the weather ought to lead to the immediate application of the knowledge required to practical uses. But I have yet to find that the results obtained have hitherto been put to any such use, obvious and instant though the application may appear to be.

[2] Translation by Mr. W. W. Reed is on file in the Weather Bureau Library.

What of the future? Far more investigation is yet required into the behavior of different crops under different conditions of weather. One of the great organizations undertaking this work is the International Agricultural Institute founded by the King of Italy in 1905. This organization comprises representatives of practically every government on the face of the globe. It was founded primarily to give to farmers throughout the world information concerning supply and demand in various countries.

Some years ago, the institute appointed a permanent committee on agricultural Meteorology whose duties are: (1) Finding the importance of daily records of the weather in determining the statistics of the most favorable conditions. (2) Studying of the factors which contribute to the largest yield. (3) Studying the relation that exists between the totality of the crops and the aggregate of the various atmospheric phenomena. (4) Determination of the "good agricultural year" in relation to atmospheric conditions. (5) Studying the different elements necessary for a good harvest, e. g., amount of light, heat, humidity, rain, etc.

How little has been done toward the solution of these problems! Do we know the answer to a single one of these questions? Truly the task involved in these few apparently simple questions is a gigantic one, a task demanding the patient collaboration of a host of enthusiastic workers.

WORLD DEVIATION OF PRESSURE AND TEMPERATURE FROM NORMAL, 1910.

[Reprinted from *Nature* (London), Sept. 15, 1921, p. 97.]

Charts showing the deviation of the pressure and temperature from normal values for each month and for the year 1910, based on observations at land stations—generally two for each 10-degree square of latitude and longitude—have just been published by the Meteorological Office under the title "Reseau Mondial, 1910." The charts have been prepared to illustrate the tables which were issued in 1920, and a similar volume of charts for 1911 was published in 1916.

This world-wide meteorology will add much to our present knowledge of weather changes, which in many respects are exceedingly intricate; it is by such world-wide information that we may eventually hope to forecast for longer periods than is possible at present; and in time, perhaps, we may foresee the character of a coming season. Atmospheric pressure lines of equal deviation from normal are given for each five millibars, and for temperature the individual deviations are plotted for each station.

Among many other questions of interest such charts may render it possible to form some idea as to whether the pressure of the atmosphere is always practically uniform over the world as a whole. The charts in question would seem to suggest that it is, but a more detailed examination must be made to substantiate such a conclusion.

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C. FITZHUGH TALMAN, Professor in Charge of Library.

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